

What is claimed is:

1. (Amended) A plasma processing apparatus for performing a process on a substrate (11) by exposing the substrate to a plasma generation region (22), the apparatus comprising:
  - 5 a chamber (1) for accommodating therein the substrate (11);
  - a top plate unit (4) serving as a part of partition walls of the chamber (1); and
  - 10 an antenna unit (3) for supplying a high frequency electromagnetic field into the chamber (1) to directly form the plasma generation region (22) in a region between the top plate unit (4) and the substrate (11) accommodated in the chamber (1),
  - 15 wherein the top plate unit (4) includes:
    - a flat plate portion (4a) disposed to face the substrate (11) and being in contact with the antenna unit (3); and
    - a side wall portion (4b) formed to extend from a peripheral region of the flat plate portion (4a)  
20 towards a side where the substrate (11) is disposed, and
  - wherein sides of the flat plate portion (4a) and the side wall portion (4b) facing the plasma generation region  
25 (22) have a smooth and curved surface extending between the flat plate portion (4a) and the side wall portion (4b).

2. The plasma processing apparatus of claim 1, wherein  
the side wall portion (4b) has a thickness of  $\lambda_g/4$  or  
greater,  $\lambda_g$  being a wavelength of a high frequency  
electromagnetic field based on a dielectric constant of the  
5 top plate unit (4).

3. The plasma processing apparatus of claim 2, wherein the side wall portion (4b) has a thickness smaller than  $\lambda_g$ .

4. (Cancelled)

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5. The plasma processing apparatus of claim 1, comprising a gas injection opening (13) for supplying a gas into the chamber (1), wherein the gas injection opening (13) is disposed to inject the gas along the side wall portion (4b).

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6. The plasma processing apparatus of claim 1, wherein the chamber (1) includes a conductive portion (1) being in contact with an outer periphery of the side wall portion (4b).

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7. (Added) The plasma processing apparatus of claim 1, wherein an inner shape of the top plate unit (4) is of a bell jar type.

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8. (Added) The plasma processing apparatus of claim 1, wherein the antenna unit (3) includes a slot plate (3c) in which a plurality of openings for irradiating a microwave towards an inside of the chamber (1) are provided.

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9. (Added) The plasma processing apparatus of claim 1, wherein a gap is provided between the side wall portion (4b)

of the top plate unit (4) and the chamber (1).

10. (Added) The plasma processing apparatus of claim 1,  
wherein the side wall portion (4b) of the top plate unit (4)  
5 is in close contact with the chamber (1) without having a  
gap therebetween.

11. (Added) A plasma processing apparatus for performing a  
process on a substrate (11) by exposing the substrate to a  
10 plasma generation region (22), the apparatus comprising:

a chamber (1) for accommodating therein the substrate  
(11);

a top plate unit (4) serving as a part of partition  
walls of the chamber (1); and

15 an antenna unit (3) for supplying a high frequency  
electromagnetic field into the chamber (1) to directly form  
the plasma generation region (22) in a region between the  
top plate unit (4) and the substrate (11) accommodated in  
the chamber (1),

20 wherein the top plate unit (4) includes:

a flat plate portion (4a) disposed to face the  
substrate (11) and being in contact with the antenna  
unit (3); and

25 a side wall portion (4b) formed to extend from a  
peripheral region of the flat plate portion (4a)  
towards a side where the substrate (11) is disposed,

and

wherein a thickness of the side wall portion (4b) is smaller than that of the flat plate portion (4a).

5 12. (Added) The plasma processing apparatus of claim 11, wherein the antenna unit (3) includes a slot plate (3c) in which a plurality of openings for irradiating a microwave towards an inside of the chamber (1) are provided.

10 13. (Added) The plasma processing apparatus of claim 11, wherein a gap is provided between the side wall portion (4b) of the top plate unit (4) and the chamber (1).

15 14. (Added) The plasma processing apparatus of claim 11, wherein the side wall portion (4b) of the top plate unit (4) is in close contact with the chamber (1) without having a gap therebetween.

20 15. (Added) The plasma processing apparatus of claim 11, wherein the side wall portion (4b) has a thickness of  $\lambda_g/4$  or greater,  $\lambda_g$  being a wavelength of a high frequency electromagnetic field based on a dielectric constant of the top plate unit (4).

25 16. (Added) The plasma processing apparatus of claim 15, wherein the side wall portion (4b) has the thickness smaller

than  $\lambda_g$ .

17. (Added) The plasma processing apparatus of claim 11,  
wherein sides of the flat plate portion (4a) and the side  
5 wall portion (4b) facing the plasma generation region (22)  
have a smooth and curved surface extending between the flat  
plate portion (4a) and the side wall portion (4b).

18. (Added) The plasma processing apparatus of claim 17,  
10 wherein an inner shape of the top plate unit (4) is of a  
bell jar type.

19. (Added) The plasma processing apparatus of claim 11,  
comprising a gas injection opening (13) for supplying a gas  
15 into the chamber (1), wherein the gas injection opening (13)  
is disposed to inject the gas along the side wall portion  
(4b).

20. (Added) The plasma processing apparatus of claim 11,  
20 wherein the chamber (1) includes a conductive portion (1)  
being in contact with an outer periphery of the side wall  
portion (4b).